

# PATENT ABSTRACTS OF JAPAN

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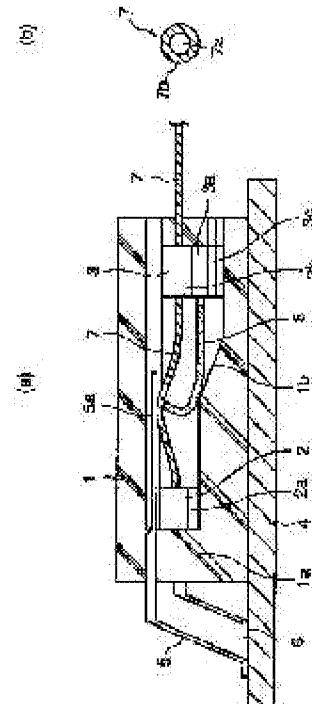
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## (54) PHOTOELECTRIC COMPOSITE TYPE CONNECTOR

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a small and simple photoelectric composite type connector being capable of simultaneously transmitting an optical signal and an electric signal at many channels and providing easy termination of a cable end.

**SOLUTION:** This connector is formed by installing an optical connection portion 2 for optically connecting and an electric connection portion 3 for electrically connecting with a plurality of conductor-type optical fibers 7 provided with an electric conductor 7b on a surface of a fiber element line 7a to simultaneously transmit an optical signal and an electric signal at many channels into a housing 1 by a separate operation. The optical connection portion 2 is installed at the back inside the housing 1. The electric connection portion 3 is pushed from the front to the back to be installed. When installed, optical connection with a photoelectric transducing module 1a of the housing 1 is made at the optical connection portion 2. The optical fiber 7 whose middle portion



is held by a fiber holding portion 3a is brought into contact with an electric connection portion 5a of an electric terminal 5 at the electric connection portion 3 by being pressed and deformed by a flat spring protrusion 8 which slides on a tapered portion 1b inside the housing 1 to deform itself when the electric connection portion 3 is pushed to be installed.

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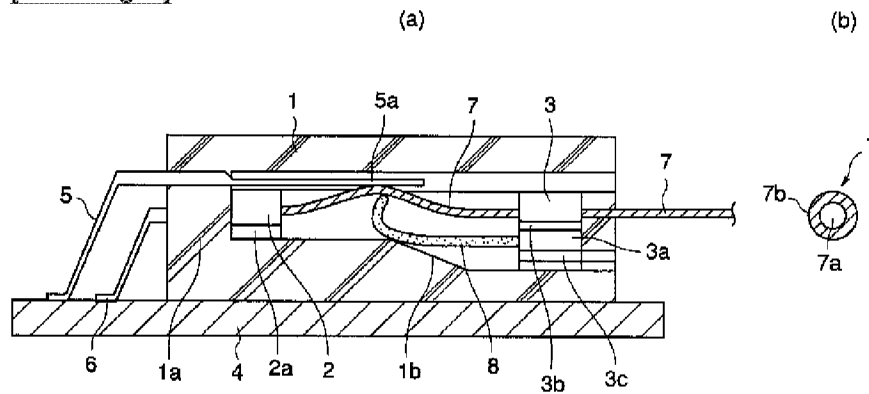
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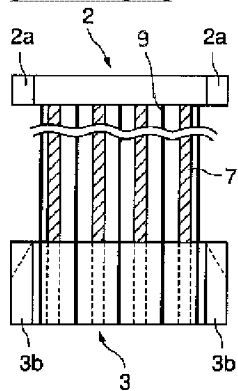
**DRAWINGS**

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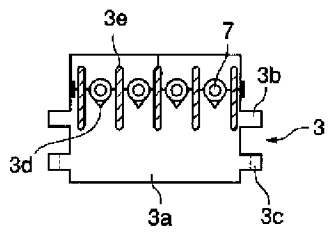
[Drawing 1]



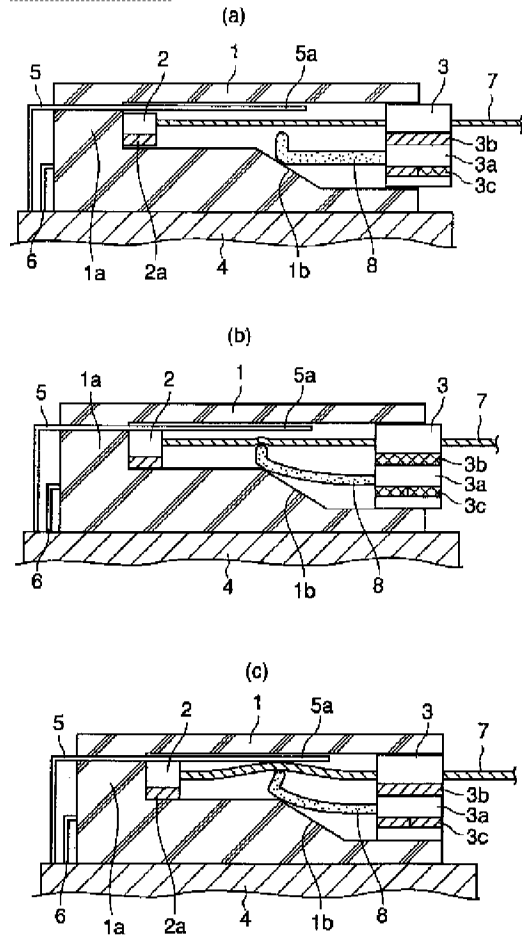
[Drawing 2]



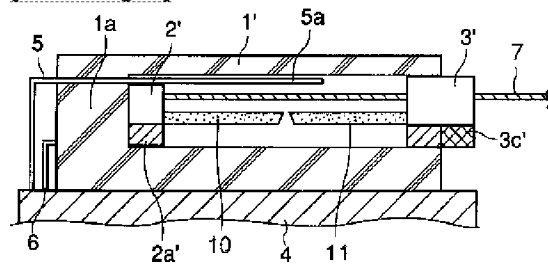
[Drawing 3]



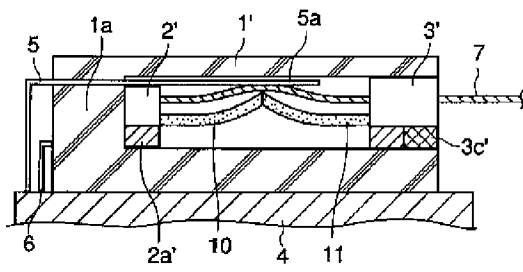
[Drawing 4]



[Drawing 5]



[Drawing 6]



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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the photoelectrical compound-die connector for mounting substrates which equips with the optical connection part which mainly makes optical connection for a lightwave signal and an electrical signal to the optical fiber which can be transmitted simultaneously, and the electrical connection which performs an electrical link in the same housing.

[0002]

[Description of the Prior Art]There are many things of composition of having exchanged the termination of an electrical cable and the cable termination of the optical fiber using the housing of an electrical connector, and having performed termination processing with the common optical connector, conventionally, The optical connector which has the bending control structure of the optical fiber indicated by JP,9-33755,A as other composition is mentioned.

[0003]The plug which comprises the KURAMBU member in which the concave opening part was provided, and a tabular base part in this optical connector is used, By making the inclined bottom face circles divided at the predetermined intervals by the side wall part arranged at the part on a base part crawl on the termination of two or more optical fiber core wires which it was inserted between the base part and the KURAMBU member, and were exposed from the concave opening part, it is considered as the structure which can control bending of an optical fiber core wire. However, in the case of such an optical connector, two or more optical fibers are installed side by side, and a lightwave signal can be transmitted by multi systems, but since it is the structure of transmitting a lightwave signal for exclusive use by an optical fiber fundamentally, an electrical signal cannot be transmitted simultaneously.

[0004]So, these days, the photoelectrical compound-die connector which can be transmitted is

also simultaneously developed in the lightwave signal and the electrical signal, and what was indicated by JP,5-7686,B as an example is mentioned. This photoelectrical compound-die connector holds the optical fiber of the couple for transmission and reception of a lightwave signal in a conductive case, and. The electric wire (usable also in the thing of a coaxial type) of the couple for transmission and reception of an electrical signal is connected, optical coupling of the thing for lightwave signal transmission of an optical fiber is carried out to the light emitting device provided in the mating connector, and optical coupling of the thing for lightwave signal reception is carried out to the photo detector provided in the mating connector. Here, an optical fiber and an electric wire are combined using an electric connection terminal or a junction arm, and it is made to perform holding to a case simple.

[0005]

[Problem(s) to be Solved by the Invention]Since it is the structure which carries out hybrid use to the last by using the optical fiber for lightwave signals, and the electric wire for electrical signals as a different body in the case of the photoelectrical compound-die connector mentioned above, In making a lightwave signal and an electrical signal into the structure which can be transmitted simultaneously by multi systems, it needs a big thing for a case, If it is a technique with which the miniaturization of the whole which is the indispensable demand from the electronic-communications-equipment field in recent years in which such a connector is carried not only becomes difficult, but combines an optical fiber and an electric wire using an electric connection terminal or a junction arm, Part mark increase, the management and connecting work of a cable take time and effort, and there is a problem that the termination processing of a cable will become complicated.

[0006]It was made that this invention should solve such a problem, and the technical technical problem is in providing the photoelectrical compound-die connector of a small and simple structure with easy termination processing of a cable simultaneously by multi systems that it can transmit about a lightwave signal and an electrical signal.

[0007]

[Means for Solving the Problem]According to this invention, equip with an optical connection part which makes optical connection for a lightwave signal and an electrical signal to a conductivity-type optical fiber which can be transmitted simultaneously by a conductor being given to the surface of fiber wires which accomplish an optical fiber core wire, and an electrical connection which performs an electrical link in the same housing, and while, A photoelectrical compound-die connector which has the structure where an inner is equipped with this optical connection part within this housing, and this electrical connection pushes into an inner and it is equipped with it from this side is obtained.

[0008]According to this invention, in the above-mentioned photoelectrical compound-die connector housing, A photoelectric conversion module which carries out optical coupling by

contact with an optical connection part, is provided with a carrier and a light receiving and emitting element which emits light, and carries out photoelectric conversion of the lightwave signal, Have a terminal for photoelectric conversion modules connected to a photoelectric conversion module, and an electric terminal containing an electric contact part contacted to the conductivity-type optical fiber surface, and an electrical connection, A photoelectrical compound-die connector which has a fiber attaching part holding a middle portion of a conductivity-type optical fiber and an elastic pressing piece which carries out press deformation of the conductivity-type optical fiber, and performs contact with an electric contact part while carrying out the very thing modification on the occasion of pushing wearing is obtained.

[0009]On the other hand, according to this invention, in the above-mentioned photoelectrical compound-die connector, a photoelectrical compound-die connector which is the flat spring projection of the shape of an L character to which press deformation of the conductivity-type optical fiber is carried out is obtained, an elastic pressing piece sliding with a wall in housing, and carrying out the very thing modification on the occasion of pushing wearing.

[0010]On the other hand, according to this invention, in the above-mentioned photoelectrical compound-die connector an elastic pressing piece, Carry out press deformation of the conductivity-type optical fiber, colliding with a counterpart of symmetrical shape implanted in a wall in housing on the occasion of pushing wearing, and carrying out the very thing modification convex, and. A photoelectrical compound-die connector which is a tabular piece which tips are processed into tapered shape, is compared and changes between these counterparts is obtained.

[0011]According to this invention, in which photoelectrical compound-die connector of the above a conductivity-type optical fiber, Into a portion [ two or more things are connected to an optical connection part, and it is held at a fiber attaching part of an electrical connection and is equipped with an optical connection part and an electrical connection in housing ] of a between. Two or more non-conducting comb shape projection pieces for being isolated electrically are put in order, and between what a conductivity-type optical fiber adjoins is arranged, A photoelectrical compound-die connector in which two or more slits for pushing into a fiber attaching part of an electrical connection, and accepting an end of two or more comb shape projection pieces when equipping were provided is obtained.

[0012]

[Embodiment of the Invention]An example is given to below and the photoelectrical compound-die connector of this invention is explained in detail with reference to drawings.

[0013]Drawing 1 shows the basic constitution of the photoelectrical compound-die connector concerning one example of this invention, and the thing about the side sectional view in which the figure (a) fractured the housing 1 in one plane direction, and the figure (b) are related with



the sectional view of the conductivity-type optical fiber 7 with which connection is presented.

[0014]This photoelectrical compound-die connector is what treats simultaneously two or more conductivity-type optical fibers 7 which can be transmitted by multi systems for a lightwave signal and an electrical signal by the conductor 7b being given to the surface of the fiber wires 7a which accomplish an optical fiber core wire, Equip with the optical connection part 2 which makes optical connection to the conductivity-type optical fiber 7, and the electrical connection 3 which performs an electrical link by separate operation in the same housing 1, and while, An inner is equipped with the optical connection part 2 in first stage within the housing 1, and the electrical connection 3 has after that the structure which pushes into an inner and with which it is equipped from this side.

[0015]The housing 1 here is provided with the following.

Build the photoelectric conversion module 1a which carries out optical coupling by contact with the optical connection part 2 optically connected with two or more conductivity-type optical fibers 7, is provided with a carrier and two or more light receiving and emitting elements which emit light, and carries out photoelectric conversion of the lightwave signal in the position by which the optical connection part 2 is contacted, and also. Two or more terminals 6 for photoelectric conversion modules connected to the photoelectric conversion module 1a. Two or more electric terminals 5 containing the electric contact part 5a contacted to each conductivity-type optical fiber 7 surface.

The end of the housing 1 here, each electric terminal 5 exposed to the method of the outside, and each terminal 6 for photoelectric conversion modules is arranged on the printed circuit board 4, and connection fixation is carried out to the pattern for connection which was pulled out from the electronic circuit on the printed circuit board 4, and was allocated in the prescribed spot.

[0016]By this, along the slot which was established in the both sides in the housing 1 and which carries out a schematic illustration, the guide rail 2a is formed in the optical connection part 2 so that it may be movable, Along the slot which was established in the upper and lower sides of the both sides in the housing 1 also in the electrical connection 3, respectively and which carries out a schematic illustration, the guide rail 3b and the lock and guide rail 3c stopped when moving in a prescribed spot are formed so that it may be movable. Since the back quantity size's being large to the optical connection part 2 compared with the optical connection part 2 to the guide rail 2a being formed in the both side surfaces of a direction vertical to a mounting direction [ / in the housing 1 ] in one step in the case of the electrical connection 3, speaking concretely, By two steps of upper and lower sides, the lock and guide rail 3c is formed in the lower-berth side, and the guide rail 3b is formed in the both side surfaces of the direction vertical to a mounting direction [ / in the housing 1 ] at the upper row side.

[0017]The electrical connection 3 has the following.

The fiber attaching part 3a holding the middle portion of the conductivity-type optical fiber 7. The flat spring projection 8 of the shape of an L character to which press deformation of the conductivity-type optical fiber 7 is carried out while sliding with the elastic pressing piece which carries out press deformation of the conductivity-type optical fiber 7, and performs contact with the electric contact part 5a while carrying out the very thing modification on the occasion of pushing wearing, i.e., the wall processed as the taper part 1b in the housing 1, and carrying out the very thing modification.

[0018]Drawing 2 is a top view fracturing and showing a part of situation of arrangement of the comb shape projection piece 9 arranged between the optical connection part 2 in the housing 1 with which this photoelectrical compound-die connector is equipped, and the electrical connection 3.

[0019]Here, two or more conductivity-type optical fibers 7 are connected to the optical connection part 2, and. It is held at the fiber attaching part 3a of the electrical connection 3, and signs that two or more non-conducting comb shape projection pieces 9 for being isolated electrically are put in order, and between those by which the conductivity-type optical fiber 7 adjoins the portion between the optical connection part 2 in the housing 1 and the electrical connection 3 is arranged further are shown.

[0020]Drawing 3 is a side view from one way showing the details composition of the electrical connection 3 with which this photoelectrical compound-die connector is equipped.

[0021]Here, the fiber attaching part 3a of the electrical connection 3 has up-and-down 2 stage structure, The guide rail 3b and the lock and guide rail 3c which were mentioned above in the lower-berth part which occupies most back quantity sizes are provided, and also. 3 d of V character-like slots for making each conductivity-type optical fiber 7 easy to equip the pars basilaris ossis occipitalis in the lower half of a mounting groove to each conductivity-type optical fiber 7 with along a gravity direction are provided, and. It is shown that the lower half which accomplishes two or more slits 3e for accepting the end of each comb shape projection piece 9 mentioned above among mounting grooves is provided, and the upper half of the mounting groove to each conductivity-type optical fiber 7 and the upper half which accomplishes each slit 3e are established in the upper row part.

[0022]In the case of such a photoelectrical compound-die connector of composition, two or more conductivity-type optical fibers 7 which can be transmitted are targeted simultaneous for a lightwave signal and an electrical signal by multi systems, Make the slot for the guide rails 2a in the housing 1 meet in [ after connecting each conductivity-type optical fiber 7 to the optical connection part 2 optically ] first stage, and it equips with the optical connection part 2 in the housing 1, Each conductivity-type optical fiber 7 is held after that by the fiber attaching part 3a

of up-and-down 2 stage structure of the electrical connection 3. While the flat spring projection 8 of the electrical connection 3 carries out the very thing modification by pushing in and equipping the object for the guide rails 3b in the \*\* housing 1, and the slot for the lock and guide rails 3c with the electrical connection 3. Since it works so that press deformation of each conductivity-type optical fiber 7 may be carried out and each conductivity-type optical fiber 7 surface may be contacted to the electric contact part 5a of each electric terminal 5, a lightwave signal and an electrical signal can be simultaneously transmitted by multi systems, and also the termination processing of a cable serves as an easy small and simple structure. Among what each conductivity-type optical fiber 7 adjoins, it is arranged by the comb shape projection piece 9, respectively, and at the time of pushing wearing of the electrical connection 3. In order that each slit 3e provided in the fiber attaching part 3a may accept the end of each comb shape projection piece 9, the electric short circuit by mutual modification contact of each conductivity-type optical fiber 7 is prevented, and safety is secured.

[0023]It is a side sectional view fracturing and showing the housing 1 in one plane direction in order that drawing 4 may explain operation of pushing wearing of an electrical connection with which this photoelectrical compound-die connector is equipped according to a stage, The figure (a) is pushed in, pushes in the thing about the previous state, and the figure (b), pushes in the thing about a state, and the figure (c) on the way, and is related with a completion state.

[0024]Are contacted by first stage wearing at the photoelectric conversion module 1a, if drawing 4 (a) is referred to first in the case of this photoelectrical compound-die connector, in the pushing previous state, optical coupling of the optical connection part 2 is carried out, and it is in the state where a lightwave signal can be transmitted, but. The part has projected the direction of the electrical connection 3 to the near side in the housing 1, the tip of the flat spring projection 8 is near the taper part 1b of the housing 1, and the very thing modification is not carried out, and since the conductivity-type optical fiber 7 surface and the electric contact part 5a of the electric terminal 5 are noncontact states, an electrical signal is not transmitted.

[0025]Next, if drawing 4 (b) is referred to, in the middle of pushing in a state. The electrical connection 3 is followed on pushing into the back side from the near side in the housing 1, . After the tip of the flat spring projection 8 contacts the taper part 1b of the housing 1, carry out the very thing modification, run the taper part 1b top aground in the direction of back quantity, and in contact with the conductivity-type optical fiber 7 surface, change the conductivity-type optical fiber 7 soon. In this state, although the conductivity-type optical fiber 7 changes a little and approaches the electric contact part 5a of the electric terminal 5, since the conductivity-type optical fiber 7 surface and the electric contact part 5a of the electric terminal 5 are still noncontact states, an electrical signal is not transmitted.

[0026]If drawing 4 (c) is referred to, in a pushing completion state. The electrical connection 3 is pushed in in the housing 1 to the position which is equal to the side of the near side of the

housing 1, An electrical signal is transmitted, in order for the tip of the flat spring projection 8 to promote modification of the conductivity-type optical fiber 7 in this state and to make the conductivity-type optical fiber 7 surface and the electric contact part 5a of the electric terminal 5 into a contact state soon.

[0027]Drawing 5 is a side sectional view fracturing and showing housing 1' in one plane direction, in order to explain the basic constitution of the photoelectrical compound-die connector concerning other examples which changed a part of photoelectrical compound-die connector of one example mentioned above, and the pushing previous state of the electrical connection. Drawing 6 is a side sectional view fracturing and showing housing 1' in one plane direction, in order to explain the pushing completion state of the electrical connection of the photoelectrical compound-die connector concerning other examples shown in drawing 5.

[0028]In the case of this photoelectrical compound-die connector, compared with the thing of one previous example, the elastic pressing piece which carries out press deformation of the conductivity-type optical fiber 7, and performs contact with the electric contact part 5a while carrying out the very thing modification on the occasion of pushing wearing in electrical connection 3' is transformed, Carry out press deformation of the conductivity-type optical fiber 7, colliding with the tabular piece 10 of the counterpart of the symmetrical shape implanted in the wall in housing 1' on the occasion of pushing wearing, and carrying out the very thing modification convex, and. By considering it as the tabular piece 11 which tips are processed into tapered shape, is compared and changes between the tabular pieces 10 of a counterpart, It has a flat structure where the inside of housing 1' does not need the taper part 1b, The point used as the structure where a back quantity size is enlarged, optical connection part 2' has guide rail 2a', a back quantity size is made small by the electrical connection 3 with the same back quantity size as optical connection part 2', and electrical connection 3' has only lock and guide rail 3c' by this is different.

[0029]Are contacted by first stage wearing at the photoelectric conversion module 1a, if drawing 5 is referred to first in the case of this photoelectrical compound-die connector, in the pushing previous state, optical coupling of optical connection part 2' is carried out, and it is in the state where a lightwave signal can be transmitted, but. The part has projected the direction of electrical connection 3' to the near side in housing 1', The very thing modification of the tabular piece 11 which tips are processed into tapered shape, is compared and changes between the tabular pieces 10 of a counterpart is not carried out, and since the conductivity-type optical fiber 7 surface and the electric contact part 5a of the electric terminal 5 are noncontact states, an electrical signal is not transmitted.

[0030]However, if drawing 6 is referred to, in a pushing completion state. By pushing in electrical connection 3' in housing 1' to the position which is equal to the side of the near side of housing 1', In the tabular piece 11 which tips are processed into tapered shape, is compared

and changes, in contact with the tabular piece 10 of a counterpart, both sides do the very thing modification, An electrical signal is transmitted, in order to promote the modification and to make the conductivity-type optical fiber 7 surface and the electric contact part 5a of the electric terminal 5 into a contact state soon, after a contact part rises to a back quantity dimension direction and contacts the conductivity-type optical fiber 7.

[0031]Therefore, like [ in this photoelectrical compound-die connector ] the thing of one previous example, a lightwave signal and an electrical signal can be simultaneously transmitted by multi systems, and also it is easy, and the termination processing of a cable is small and, moreover, serves as a structure still simpler than the thing of one example.

[0032]In the case of the photoelectrical compound-die connector of each example mentioned above, the housing 1 and 1' have the photoelectric conversion module 1a, the electric terminal 5, and the terminal 6 for photoelectric conversion modules, and explained as composition for mounting substrates which arranged these on the printed circuit board 4, but. It is also possible to constitute as a tandem type which fits in between counterparts, without making the method of outside project without carrying out connection fixation of the electric terminal 5 and the terminal 6 for photoelectric conversion modules on the printed circuit board 4, and requiring the printed circuit board 4.

[0033]

[Effect of the Invention]According to the photoelectrical compound-die connector of this invention, it is aimed at two or more conductivity-type optical fibers to which the conductor was given on the surface of fiber wires so that a lightwave signal and an electrical signal could be simultaneously transmitted by multi systems as explained above, It equips in housing in [ after connecting each conductivity-type optical fiber to an optical connection part optically ] first stage, Each conductivity-type optical fiber is held by the fiber attaching part of an electrical connection after that. In order to work so that press deformation of each conductivity-type optical fiber may be carried out and each conductivity-type optical fiber surface may be contacted to the electric contact part of each electric terminal while the elastic pressing piece board of an electrical connection carries out the very thing modification by pushing in and equipping with an electrical connection in \*\* housing, A lightwave signal and an electrical signal can be simultaneously transmitted by multi systems, and also a small and simple structure with easy termination processing of a cable comes to be embodied. Into the portion [ in the case of this photoelectrical compound-die connector, it is equipped with the optical connection part and electrical connection in housing ] of a between. Two or more non-conducting comb shape projection pieces for between what each conductivity-type optical fiber adjoins being isolated are put in order and arranged, It has composition which provided two or more slits for pushing into the fiber attaching part of an electrical connection in connection with this, and accepting the end of each comb shape projection piece when equipping, Since the

electric short circuit by mutual modification contact of each conductivity-type optical fiber at the time of pushing wearing of an electrical connection is prevented, improvement in the safety on use and reliability comes to be measured.

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[Translation done.]

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## CLAIMS

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[Claim(s)]

[Claim 1]Equip with an optical connection part which makes optical connection for a lightwave signal and an electrical signal to a conductivity-type optical fiber which can be transmitted simultaneously by a conductor being given to the surface of fiber wires which accomplish an optical fiber core wire, and an electrical connection which performs an electrical link in the same housing, and while, A photoelectrical compound-die connector having the structure where an inner is equipped with this optical connection part within this housing, and this electrical connection pushes into an inner and it is equipped with it from this side.

[Claim 2]The photoelectrical compound-die connector comprising according to claim 1:  
A photoelectric conversion module which carries out optical coupling of said housing by contact with said optical connection part, is provided with a carrier and a light receiving and emitting element which emits light, and carries out photoelectric conversion of said lightwave signal.

A terminal for photoelectric conversion modules connected to said photoelectric conversion module.

A fiber attaching part which is equipped with an electric terminal containing an electric contact part contacted to said conductivity-type optical fiber surface and in which said electrical connection holds a middle portion of said conductivity-type optical fiber.

An elastic pressing piece which carries out press deformation of said conductivity-type optical fiber, and performs contact with said electric contact part while carrying out the very thing modification on the occasion of pushing wearing.

[Claim 3]A photoelectrical compound-die connector characterized by said elastic pressing piece being the flat spring projection of the shape of an L character to which press deformation of said conductivity-type optical fiber is carried out while sliding with a wall in said housing and

carrying out the very thing modification on the occasion of pushing wearing in the photoelectrical compound-die connector according to claim 2.

[Claim 4]In the photoelectrical compound-die connector according to claim 2, said elastic pressing piece, Carry out press deformation of said conductivity-type optical fiber, colliding with a counterpart of symmetrical shape implanted in a wall in said housing on the occasion of pushing wearing, and carrying out the very thing modification convex, and. A photoelectrical compound-die connector being a tabular piece which tips are processed into tapered shape, is compared and changes between these counterparts.

[Claim 5]In the photoelectrical compound-die connector according to claim 3 or 4, said conductivity-type optical fiber, Two or more things are connected to said optical connection part, and it is held at said fiber attaching part of said electrical connection, Into a portion [ it is equipped with said optical connection part and said electrical connection in said housing ] of a between. Two or more non-conducting comb shape projection pieces for being isolated electrically are put in order, and between what said conductivity-type optical fiber adjoins is arranged, A photoelectrical compound-die connector, wherein two or more slits for pushing into said fiber attaching part of said electrical connection, and accepting an end of two or more of said comb shape projection pieces when equipping are provided.

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[Translation done.]